RESEARCH DEPARTMENT

THE SERVICE AREA OF THE NORWICH TELEVISION TRANSMITTER

Report No. K-134

(1959/6)

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SUMMARY

A field strength survey of the Norwich television transmitter has been carried out. The service conforms well with that expected, covering most of Norfolk and the northern half of Suffolk, but there are two gaps between the Norwich service area and that of adjacent transmitters.*

(i) Although south-east Suffolk is within the 0·1 mV/m Norwich contour and the Norwich and Crystal Palace 0·1 mV/m contours overlap each other, the service in this area is unsatisfactory. The Norwich signal suffers from interference from other television transmitters while the Crystal Palace signal is subject to severe fading.

(ii) All three sides of The Wash, although within the 0·1 mV/m contour of Holme Moss or Norwich, are not satisfactorily served. On the Norfolk side the Norwich transmission suffers from interference from other transmitters while the other sides, although within the nominal service area of Holme Moss, are up to 100 miles (160 km) distant from it, and the service suffers serious fading and occasionally co-channel interference.

Consideration is now being given to increasing the effective radiated power (e.r.p.) of Norwich in certain directions and to the provision of additional transmitters in the two areas which are badly served.

1. INTRODUCTION

1.1. General

The original plan for providing a television service in East Anglia relied on the use of a channel in Band III. No provision was made at the Stockholm Broadcasting Conference for the use of Band I to serve the area and there was, therefore, no agreement with the European television authorities who might be affected by the operation of a Band I transmitter in East Anglia.

When, therefore, it became necessary to use Band I in this area account had to be taken of co-channel interference between the Norfolk transmitter and other United Kingdom stations, as well as of interference with and from nearby European television transmissions.

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*Including Peterborough, which is expected to come into service in 1959.

1.2. Choice of Channel and Polarization

The choice of channel was restricted to Nos. 3 or 5, Channels 1, 2 and 4 being occupied by Crystal Palace, Holme Moss and Sutton Coldfield respectively, all geographically adjacent to Norfolk.

Channel 3, using horizontal polarization, was recommended for the following reasons:

(a) Channel 3 is better than Channel 5 as the mutual interference between Norwich, Rowridge and Kirk o' Shotts is less than that which would occur between Norwich, Wenvoe and Pontop Pike. Furthermore, were Norwich to operate on Channel 5 the sound transmission (63·25 Mc/s) would seriously interfere with the vision transmission at Lopik (Holland) on 62·25 Mc/s.

(b) The interference with the reception of Liège (Belgium) on 55·25 Mc/s would be substantially less than that with Lopik if Channel 5 were used.

(c) The use of vertical polarization would reduce the interference to and from continental transmissions by about 10 dB but the mutual co-channel interference in the United Kingdom between Channel 3 transmitters would be intolerable. For this reason it was recommended that the Norwich transmitter should radiate a horizontally polarized signal.

Although Channel 3 was recommended it was necessary to obtain agreement from the Belgian authorities and to restrict the power in the direction of Liège.

1.3. Power Restrictions

As a result of negotiations with the I.N.R. it was finally agreed that the e.r.p. in the direction of Belgium should not exceed 5 kW. It was also agreed that, while a low-power transmitter at Liège was providing a temporary service pending completion of the final high-power installation, the e.r.p. of Norwich in the direction of Belgium be restricted to 0·36 kW. A further restriction, in order to protect the Rowridge signal in the Worthing area, was that in this direction the e.r.p. should not exceed 3 kW.

To obtain the horizontal radiation pattern (h.r.p.) to conform with these restrictions, an aerial consisting of four batwing elements arranged in two tiers on a lattice mast was designed. The h.r.p. for the aerial is given in Fig. 1, unit field corresponding to 10 kW e.r.p. for a transmitter output power of 5·0 kW. The maximum power in the direction of Belgium (110° to 150° E of N) is 4·8 kW and that in the direction of Brighton (195° to 210° E of N) is 3·0 kW. The h.r.p. of the temporary aerial at Norwich was similar to that shown in Fig. 1 with, of course, reduced transmitter power.

As a result of these restrictions in e.r.p., the Norwich transmitting conditions have been changed three times since the temporary service began in February 1955. The present full-power condition started in June 1958. Details of the various transmitting conditions are given in Table 1.

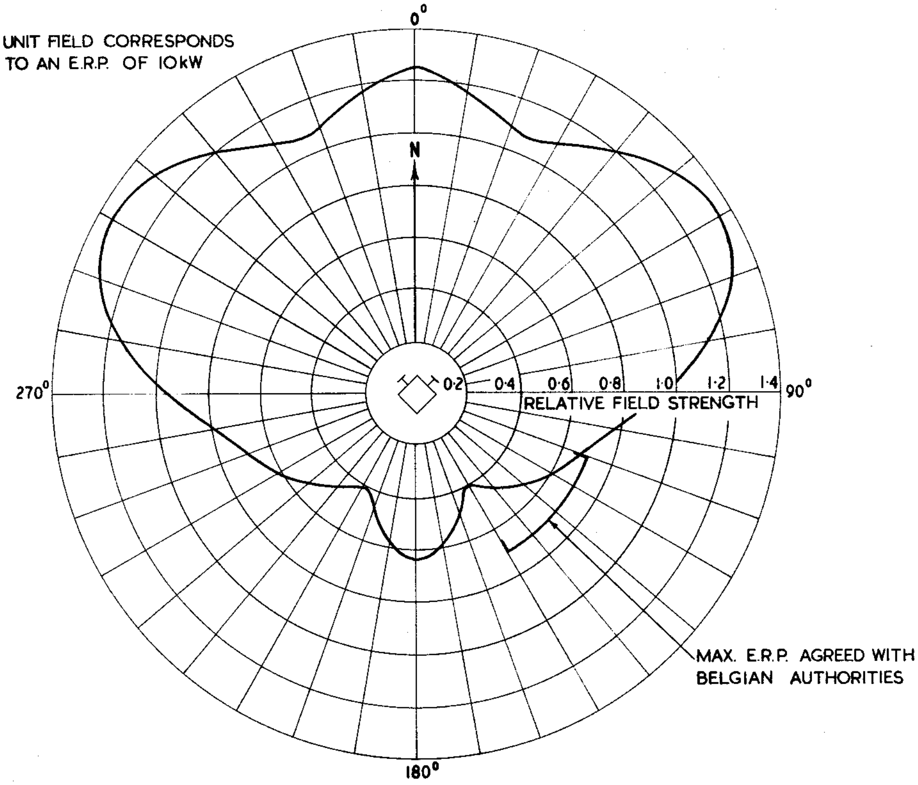


Fig. 1 - H.R.P. of Norwich Transmitter

TABLE 1

Schedule of Norwich Transmitting Conditions

Date	Transmitter Output Power kW	Aerial		Aerial Height a.g.l. ft	m
1.2.55	v. 0·5 s. 0·125	Temporary	1 tier only	200	61
8.10.56	v. 0·5 s. 0·125	Final	2 tiers	416	127
1.12.57	v. 2·5 s. 0·625	Final	1 tier only	416	127
9.6.58	v. 5·0 s. 1·25	Final	2 tiers	416	127

2. GENERAL

The Norwich television transmitter is sited near the village of Tacolneston, about 8 miles (14·5 km) south-west of the city of Norwich. The transmitter is a nominal 5 kW unit; the e.r.p. varies from 1·6 to 18 kW according to direction. The transmitter drives a four-element batwing aerial arranged in two tiers on a lattice mast. The mid-point of the aerial is 416 ft (127 m) above ground level and the site is 230 ft (70 m) above mean sea level. The transmission is horizontally polarized and the vision frequency is 56·75 Mc/s (Channel 3).

The inner contours of the survey (5·0 mV/m, 2·0 mV/m, 1·0 mV/m and 0·5 mV/m) are based on measurements made while the station was operating in one of its interim conditions, the low-power transmitter with an output of 0·5 kW driving the whole of the main aerial. The outer contours (0·2 mV/m and 0·1 mV/m) were measured when the station was operating in its final condition. The field strength of the sound transmission was measured with a horizontal loop aerial mounted 12 ft (3·7 m) above ground level and the values so obtained have been corrected to correspond to the peak-white value (transmitter output power 5·0 kW) at a height of 30 ft (9·1 m) above ground level.

3. RESULTS OF SURVEY

As noted in the Introduction, no provision was made for a Band I transmitter at Norwich and it was squeezed into the band at the expense of interference from U.K. transmitters and certain continental transmitters, notably Liège.

Fig. 2 (map T.476) therefore shows, in addition to the usual contours of the transmission surveyed, the limit of the area free from perceptible co-channel interference for 90% of the time from (i) U.K. transmitters and (ii) continental transmitters. It will be seen that the line defining the area free from interference is coincident for both sources from The Wash to Mildenhall, the limit being approximately the 0·25 mV/m contour, while from Mildenhall eastwards to the coast the continental interference gradually increases until, near Lowestoft, it restricts the service for 10% of the time to a field strength of 0·45 mV/m.

Multi-element receiving aerials will help viewers in certain areas. In south-east Suffolk such an aerial may be expected to increase the area free from continental interference to the 0·2 mV/m contour while a single-element aerial will discriminate against the interference in the Stowmarket-Newmarket arc. Multi-element aerials will not, however, provide any protection against continental interference in the area of The Wash nor will they give any significant protection against U.K. co-channel interference anywhere in the service area because the interfering stations, Kirk o' Shotts and Rowridge, are both cross-polarized in relation to the Norwich transmission.

When the Peterborough transmitter comes into service, the Norwich 0·1 mV/m contour will overlap that of Holme Moss, Peterborough and Crystal Palace except for the triangular area of Suffolk containing Aldeburgh, Woodbridge and Orfordness. It should be noted, however, that the large industrial town of Ipswich on the fringe of the Crystal Palace service area gets a very poor service; therefore, taking account of fading (Ipswich is 82 miles (132 km) from Crystal Palace) and the discrimination of multi-element aerials against interfering transmitters, the effective gap between the Crystal Palace and Norwich service areas may be defined roughly by a line drawn from Clacton on Sea, north-west to Hadleigh, north to Stowmarket and north-east

T476

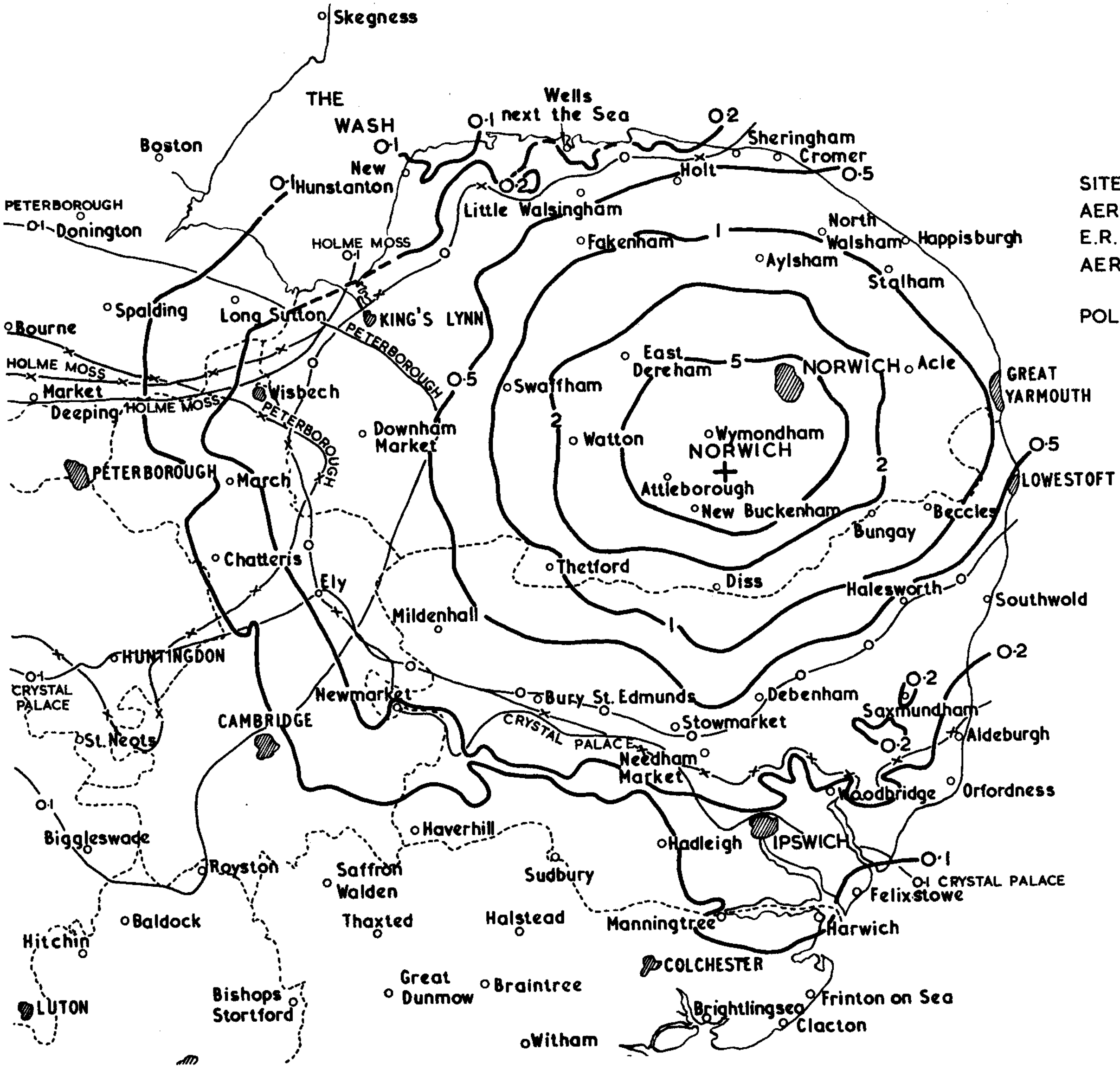
FIG.2
NORWICH
BAND I
(MEASURED)

CHANNEL 3 (56·75 MC/S)

SITE HEIGHT:	230 ft. (70 m) AMSL
AERIAL HEIGHT:	416 ft. (127 m) AGL
E.R.P:	1·6 – 18 kW
AERIAL:	TWO TIERS OF TWO TANGENTIAL BATWINGS
POLARIZATION:	HORIZONTAL

POPULATION WITHIN:—

5·0 mV/m	168,200
0·5 mV/m	492,300
0·1 mV/m	1,088,700



Note:
The contours represent the field strength in mV/m 30 ft. (9·1 m) above ground exceeded at 50% of the receiving sites in a given locality. The value exceeded at 90% of the receiving sites may be as much as 10 dB below the value indicated by the contours particularly in hilly and built-up areas.

—x—x— Limit of service area free from perceptible interference from co-channel transmitters for 90% of the time estimated from the C.C.I.R. Tropospheric Curves dated Stockholm 1952. The protection ratio on which the estimates are based is 30 dB with a reduction of 10 dB for crossed polarization.

—o—o— Limits of areas free from perceptible co-channel interference from continental transmissions.

——— 0·1 mV/m contour for Crystal Palace, Peterborough and Holme Moss.

10 0 10 20 Miles

10 0 10 20 30 Kilometres

to the sea at Southwold. The area on the three sides of The Wash is not satisfactorily served for, although the south-western and north-western areas are within the 0·1 mV/m contour of Holme Moss, fading is severe (Skegness is 100 miles (160 km) from Holme Moss).

With the exception of the areas of poor service detailed above most of East Anglia and adjacent areas get a satisfactory service. Great Yarmouth with a median field strength of 0·6 mV/m and Lowestoft with 0·4 mV/m will, however, be subject occasionally to continental interference and the field strength is not really adequate for such centres of population.

Details of the field strength in all towns with populations of 1000 or more are given in the Appendix.

4. CONCLUSIONS

Although no preliminary tests were made at Tacolneston the service area agrees well with that predicted. It gives a reasonable overlap with that of the projected Peterborough transmitter and with parts of the Crystal Palace service area. The overlap with Holme Moss in The Wash area and with Crystal Palace in south-east Suffolk is not satisfactory.

APPENDIX

Field strength in mV/m at 30 ft (9·1 m) AGL

Town	Field strength exceeded at stated percentage locations		
	10%	50%	90%
Acle	1·6	1·1	0·55
Aldeburgh	0·28	0·13	0·06
Attleborough	20	16	10
Aylsham	1·6	1·0	0·5
Beccles	2·0	1·1	0·4
Brandon	1·3	0·6	0·35
Bungay	3·0	1·8	0·7
Burnham Market	0·2	0·12	0·07
Bury St. Edmunds	0·6	0·3	0·16
Caister on Sea	0·9	0·6	0·4
Cawston	3·5	2·0	0·35
Clenchwarton	0·15	0·3	0·18
Coltishall	2·8	2·0	1·1
Cromer	0·35	0·25	0·11
Dereham	4·5	3·0	1·3
Dersingham	0·25	0·14	0·07
Diss	3·0	1·6	0·8
Docking	0·8	0·45	0·3
Doddington	0·2	0·15	0·1
Downham Market	0·45	0·22	0·11
Ely	0·5	0·25	0·16
Eye	1·4	1·1	0·55
Fakenham	0·9	0·5	0·25
Feltwell	0·6	0·4	0·25
Framlingham	0·4	0·22	0·11
Great Yarmouth and Gorleston	1·0	0·6	0·3
Harleston	1·8	1·1	0·6
Harwich	0·2	0·12	0·06
Heacham	0·2	0·1	0·06
Holbeach	0·17	0·12	0·1
Holt	0·9	0·6	0·4
Honington	1·3	0·8	0·55
Horsham St. Faith	3·5	2·2	1·4
Hunstanton	0·25	0·16	0·1
Ipswich	0·35	0·16	0·07
Kessingland	1·3	0·9	0·28
King's Lynn	0·5	0·35	0·22
Leiston	0·18	0·11	–
Littleport	0·5	0·3	0·22
Loddon	4·0	1·8	0·28
Long Sutton	0·25	0·17	0·11
Lowestoft	0·8	0·4	0·22
March	0·22	0·15	0·09
Martham	1·0	0·8	0·55
Mildenhall	0·35	0·14	0·1
Mundesley	0·6	0·45	0·3
Needham Market	0·5	0·3	0·16
New Hunstanton	0·3	0·13	0·08
Newmarket	0·3	0·16	0·07
North Walsham	1·0	0·6	0·4
Norwich	14	6·0	2·0
Ormesby St. Margaret	1·0	0·6	0·4
Pakefield	1·0	0·7	0·35
Reepham	2·8	2·2	1·0
Saxmundham	0·4	0·18	0·06
Scole	2·2	1·3	0·8
Sheringham	0·4	0·25	0·15
Shipdham	6·0	4·5	3·0
Soham	0·3	0·22	0·14
Southery	0·6	0·4	0·22
Southwold	0·5	0·3	0·09
Stalham	1·3	0·9	0·6
Stowmarket	0·55	0·3	0·14
Sutton Bridge	0·2	0·16	0·1
Swaffham	2·2	1·3	0·55
Terrington St. Clement	0·4	0·3	0·23
Thetford	1·4	0·8	0·35
Watton	3·5	2·2	1·1
Wells next the Sea	0·35	0·19	0·08
Weybourne	0·35	0·22	0·18
Wickham Market	0·3	0·18	0·1
Wisbech	0·45	0·3	0·16
Wroxham	2·5	1·6	1·1
Wymondham	55	40	25

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